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INSTRUCTIONS FOR MOUNTING  
USING, AND CARING FOR  
**BARBETTE CARRIAGE**

MODEL OF 1893

FOR

**10-INCH GUNS**

MODEL OF 1888

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*FOUR PLATES*

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MARCH 10, 1906  
REVISED JANUARY 7, 1908  
REVISED APRIL 13, 1912  
REVISED OCTOBER 17, 1916



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1916



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WAR DEPARTMENT,  
OFFICE OF THE CHIEF OF ORDNANCE,  
*Washington, October 17, 1916.*

This manual is published for the information and government of the Regular Army and the National Guard of the United States.  
By order of the Secretary of War:

WILLIAM CROZIER,  
*Brigadier General, Chief of Ordnance.*  
(3)

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[No. 1700]	

# INSTRUCTIONS FOR MOUNTING, USING, AND CARING FOR BARBETTE CARRIAGE, MODEL OF 1893, FOR 10- INCH GUN, MODEL OF 1888.

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(FOUR PLATES.)

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[The points in *italics* are of importance or concern the safety of the carriage and should be specially noted. The important changes are shown in bold-face type.]

## GENERAL DESCRIPTION.

**PRINCIPAL PARTS.**—The carriage is of the center pintle form, designed for guns of model of 1888, and consists of the following principal parts, viz, base ring resting upon the concrete platform, traversing-roller system, racer, right and left chassis, top carriage, recoil and counter-recoil system, loading platform, projectile hoist, traversing, elevating, and retracting mechanism, and accessories, including ammunition truck, shot trays, and implements.

**BASE RING.**—The base ring is of gun iron in one piece, secured to the platform by bolts through the flange. The lower roller path is on its upper surface.

The base ring is provided with leveling screws of bronze, bearing upon steel thrust plates set upon the concrete. In some of the earlier carriages wedges and plates were furnished instead of leveling screws and thrust plates.

The pintle, rising from the center and forming part of the base ring, is a cylinder with a spiral oil groove on its outer surface.

Lugs projecting from the base ring form a support for the traversing chain-adjusting bolts.

**TRAVERSING-ROLLER SYSTEM.**—Upon the lower roller path rests a circle of forged-steel live, conical traversing rollers, held in place by two concentric distance rings. The distance rings are secured to each other by braces bolted between them and the system is held concentric with the pintle by flanges on the inner ends of the rollers.

The trunnions at each end of the traversing rollers run in bearings in the distance rings, these bearings being slotted through on the underside to permit assemblage.

**RACER.**—The racer is of cast steel. The upper roller path is on its under surface and rests upon the traversing-roller system. The racer

also contains the pintle bearing, which fits over the base-ring pintle and is provided with a packed wrought-iron cover to keep out dust and water. On the top surface of the racer are the seats for the two chassis and brackets. Two cast-steel clips (one in front and one in rear) are bolted to the outer surface of the racer. These clips or guide hooks have lips which engage under a flange on the base ring. Between the clips is a dust guard which protects the traversing-roller system.

**CHASSIS AND RECOIL ROLLERS.**—The chassis are bolted to the racer. They are joined in front by a transom bolted to each chassis.

In U-shaped recesses at the top of each chassis are placed the recoil rollers, made of forged steel bushed with bronze and run on 2.5-inch journals of forged steel. These journals pass through both walls of the U-shaped recess in the chassis and are secured by being screwed into the inner wall.

The tops of the chassis rails are inclined  $4^{\circ}$  upward and to the rear. At the forward ends of the chassis there are lugs projecting upward through which the piston rods pass. Stops are placed on the chassis rails in front to limit the forward motion of the top carriage. The front surface of the projecting lugs is finished as a seat for a shield to protect the gunners. The chassis also contain bronze-bushed bearings for traversing, retracting, elevating, and projectile hoist shafts as well as the support for the crane mast and seats for various brackets.

**TOP CARRIAGE.**—The top carriage is made in one piece of cast steel. It consists of two side frames containing the beds for the trunnions of the gun and the recoil cylinders, united by a transom passing underneath the gun. The trunnion beds are bushed with bronze and each cap-square is dovetailed and secured by bolts. Grease cups attached to the upper end of the top carriage and connected to the trunnion-bed bushings by brass tubes, provide lubrication for the gun-trunnion bearings.

Flanges on the top carriages are clipped over corresponding flanges on the chassis rails.

**RECOIL BRAKE (Pl. III).**—The cylinders are 9.5 inches in interior diameter, fitted each with a piston rod 4 inches in diameter, having a piston with a diametrical clearance of 0.02 inch in the cylinder. During the recoil the pistons remain stationary and the top carriage, with its recoil cylinders, is drawn over them. Approximately uniform resistance in the cylinders is obtained by the passage of the liquid from front to rear through varying orifices caused by throttling bars whose inner faces are curved. There are two throttling bars in each cylinder held in place by bolts passing through the walls of the cylinder. Each piston has two rectangular slots fitting over the throttling bars. The sectional areas of these bars are such that the

orifices for the flow of the liquid vary with the position of the top carriage during recoil so as to obtain a nearly constant resistance in the cylinders.

The energy of recoil is taken up by the resistance which the fluid offers to being driven through the orifices. After recoiling, the gun returns to the firing position by the action of gravity, the slope of the chassis rails being sufficient to effect this motion.

A head of cast steel is screwed in the rear end of each cylinder.

The counter-recoil buffers are formed by bronze plugs attached to the rear cylinder heads and containing recesses 2 inches in diameter and 5 inches long, in which fit projections from the piston rods, having a diametrical clearance of 0.0095 inch. When the gun returns to the firing position, the liquid caught in these recesses can escape only through the small clearance, the arrangement acting as a hydraulic buffer or dashpot to check the velocity at the end of the return into battery.

At the front ends of the recoil cylinders there are the usual stuffing boxes with glands and followers. To secure equal resistance and equal fluid pressure in the two cylinders, their front or pressure ends are connected by a cored passage through the transom. In some of the carriages the cored passage is replaced by a copper equalizing pipe strapped to the front part of the transom and connecting the cylinders, this pipe being provided with an emptying coupling and plugs. Each cylinder is provided with one filling and one venthole, also with an emptying plug suitably placed.

**TRAVERSING MECHANISM.**—The carriage is traversed by a chain resting on a flange on the exterior of the base ring and coupled through its end links to two adjusting bolts passing through lugs cast on the outer vertical surface of the base ring below the roller path. By means of nuts on the adjusting bolts the chain may be given all necessary adjustment. In front of the carriage the chain passes over a sprocket wheel mounted on a vertical shaft located in the front guide hook, being held to the base ring by two guide pulleys running on vertical studs attached to the underside of the front guide hook, one on each side of the sprocket wheel. Motion is communicated to the sprocket wheel and the carriage from the traversing cranks by a suitable system of shafts and spur and bevel gearing. A brass azimuth circle attached by countersunk screws to a flange on the base ring is graduated to degrees, but the numbers are to be added after the carriage is in the emplacement.

A steel bracket bolted to the right chassis supports a brass azimuth pointer, the graduated part of which is in smooth contact with the azimuth circle. It has slotted holes to give it a lateral motion for adjustment, after which it is fixed in position by two dowels. The pointer is graduated so as to give a least reading of 0.05°.

**ELEVATING MECHANISM.**—Pointing in elevation is obtained by a bronze rack bolted to the gun. A pinion mounted on a short cross shaft engages the rack. On the outer end of this shaft there is keyed a cup-shaped friction clamp fitting over a corresponding shaped hub located on the outside of a worm gear mounted on the elevating pinion shaft and brought to a bearing in its seat by a nut on the end of the shaft. *By this arrangement excessive stress on the elevating system is relieved during firing.* This worm gear engages in a worm splined upon a vertical shaft, on the lower end of which is splined a bevel gear which engages with a second bevel gear upon the main elevating shaft, which runs parallel to the top surface of the right chassis rail. This second bevel gear slides upon the squared section of this shaft, being carried back and forth during the recoil of the top carriage. The front end of the main elevating shaft is connected with the elevating cranks, one on each side of the carriage, by a train of shafting and bevel gears.

**ELEVATION DISC AND POINTERS.**—The elevation disc consists of a circular wheel carrying the service and subcaliber range scales, which are graduated in yards. The elevation scale is graduated in  $5^{\circ}$  spaces. The elevation disc is inclosed in a case which is attached to the top carriage near the trunnion of the gun, and is actuated by means of a pinion and gear segment, the latter being secured to the gun trunnion by means of tap bolts.

**RETRACTING MECHANISM.**—For the purpose of maneuvering, and in order to ascertain from time to time whether the recoiling parts are in working order, the retracting mechanism has been provided. It consists of four double blocks, two of which are hooked to the front of the top carriage, while the other two are hooked to the rear of the chassis. A 2.25-inch manila rope runs through the blocks and the falls lead from the blocks to the retracting drums, which are keyed to the retracting-drum shaft, one at each end thereof.

To retract the gun the end of each fall is held by a cannoneer, after several turns have been taken with it around the retracting drum, and the latter is revolved by means of the retracting crank handles and intermediate mechanism until the recoiling parts are drawn to the rear a distance of 50 inches, which is the length of recoil allowed.

The motion of the retracting drums is caused by a worm wheel. This engages with a worm with triple threads keyed to a horizontal worm shaft parallel to the chassis, supported in bronze-bushed brackets bolted to the racer. At the opposite end of the shaft is a miter gear engaging with a miter gear on the horizontal crank shaft which extends through both chassis, being supported by bronze-

bushed bearings in the chassis. There are two cranks for operating this shaft, one on each side of the carriage.

The carriage, after being retracted, must be allowed to run into battery gradually, by slacking the falls as evenly as possible on either side, since the barbette carriages are not provided with means for holding and tripping. *The blocks must be removed before firing.*

**PROJECTILE HOIST, SHOT TRAYS, AND AMMUNITION TRUCKS.**—At the rear of the left chassis a crane for raising the projectile to the gun is supported in a lug cast on the chassis. The fall of the hoisting tackle leads from the crane sheave over guide sheaves to a drum mounted on a short shaft passing through the left chassis. Motion is communicated to the drum by spur gears from a parallel short shaft carrying the hoisting crank. A pawl engaging in a ratchet wheel on the crank shaft holds the projectile at any height.

Seven shot tongs, one tray, and three ammunition trucks are provided with each carriage.

**LOADING PLATFORM.**—The loading platform consists of a steel plate supported at a convenient height for loading by four frames of T iron strengthened by gusset plates riveted to the frames. To prevent the gun from striking the platform in recoil the interior is cut out, except at the rear, and replaced by a sliding plate. This plate slides in guides bolted to the under side of the platform plate and is kept at the same distance from the breech of the gun by two connecting rods joining it to lugs on the top carriage. A rail of wrought-iron tubing supported by solid-forged stanchions extends around the loading and sighting platforms. To prevent injury to personnel during firing, due to the extension of the sliding plate beyond the platform, a guard is provided at the rear of the platform plate. A set of steps bolted to the platform gives access to it on each side. Steps and step hangers are fastened to each side of the racer to facilitate reaching the racer.

A sight standard of bronze is bolted to the rear part of the right chassis for the attachment of a telescopic sight to give azimuth only.

A sighting platform for the sight standard is attached to the loading platform in convenient position for sighting.

Traversing stops, placed on each side of the base ring, and a stop attached to the rear guide hook, limit the motion in azimuth in order to prevent the loading platform from striking the parapet.

**MISCELLANEOUS.**—There are plates on the carriage indicating the direction of motion of the cranks for elevating and traversing.

Drainage holes are drilled in all pockets, and all axles, trunnions, and sliding bearing surfaces are provided with oil holes having screw plugs.

In case of damage to the equalizing pipes on carriages Nos. 1 and 11, bronze plugs have been provided for permanently closing the cavities of the pipe connections.

The necessary tools and implements for each carriage are furnished packed in a chest marked with the number of the carriage.

### ASSEMBLING THE CARRIAGE.

**IMPLEMENTS.**—The assembling requires machines and implements for mechanical maneuvers usually found at forts, but in addition to falls, blocking, jacks, sling chains, etc., shears or a derrick capable of lifting 14 tons will be found especially useful.

**GENERAL REMARKS.**—The size and weight of the carriage permit it to be transported by rail partially assembled.

*In assembling the carriage, as in all machinery, no parts should be directly struck with a steel hammer or sledge. Soft-metal drifts or copper or lead hammers should be used.*

*In unloading or handling the parts care should be exercised that the edges or finished surfaces do not become upset or burred. When two bearing surfaces are brought together, it is especially necessary that both parts should be absolutely clean, smooth, and well lubricated.*

The following description gives a statement of the order in which the parts should be put together rather than complete enumeration of the details of the operations:

*All machined parts, including all joints, keys, bolts, bolt holes, and working parts, should be thoroughly cleaned and oiled with some good lubricating oil before being assembled.*

**BASE RING.**—The base ring can be lowered onto blocks over the platform by means of a derrick or moved on skids and rollers into position. When the holes in the base ring are directly over the corresponding bolts, lower by means of jacks until the ring rests on the platform with the bolts as nearly central as possible in the holes.

**LEVELING.**—Eight bronze screws and eight steel thrust plates are provided for adjusting the level of the base ring. These serve to give the base ring proper support on the already well-set concrete and permit the grouting to become well set without deformation while the rest of the carriage is being assembled. *After the grouting under the base ring has thoroughly set, these screws should be unscrewed slightly to prevent their being overstrained in firing.*

*A sensitive machinist's level and an accurate steel straightedge should be used in leveling all parts.*

The threads of the platform bolts should be carefully examined to see that they have not been burred in the operation of lowering and to see that they are free from rust. After they have been put in good order, thoroughly oil the threads of both nuts and bolts before putting on the nuts. In screwing down the nuts on the platform



bolts, take up on each a little at a time so that no part of the base ring will be strained. Great care should be taken in setting the base ring not to spring it.

In using the level it should always be reversed and the mean of the readings in the two positions considered the true reading. The leveling may be done from the top of the pintle surface, which is machine finished for that purpose, but should be verified by placing the straightedge on the inside edge of the turned surface of the roller path, following around circumferentially each way on this surface, leveling and tightening the foundation bolts.

*The greatest care must be taken in leveling and setting the base ring, as the proper working of the carriage depends on the accuracy of this work.*

After the base ring is properly leveled, pour under it a grouting of neat Portland cement.

**DISTANCE RINGS AND TRAVERSING ROLLERS.**—Clean the lower roller path very thoroughly, after which place the rollers and distance rings in position and run them around several times by hand to see that they work freely. If there is any unreasonable bearing it must be remedied before proceeding any further.

**RACER, CHASSIS, AND TOP CARRIAGE.**—As the carriage is received at the forts the racer, chassis, and top carriage will usually be assembled. The upper roller path, as well as the pintle surfaces on both racer and base ring, should be thoroughly cleaned and oiled, after which move the racer and assembled parts over the proper position by means of skids and rollers and then lower by means of jacks. The racer should be lowered carefully to prevent any binding of the pintle surfaces. Projections from the chassis rails in front and rear will enable jacks to be engaged. When the racer is down on the rollers move it around by hand to see that it moves freely. If the chassis and top carriage are not assembled to the racer, move the racer over its position as before. Thoroughly clean and oil all contact surfaces, bolts, keys, and bolt holes. Move the chassis rails to their positions and bolt them to the racer, being careful that the keys are in their proper positions.

Bolt the transom to the chassis. If the chassis are assembled properly, the bolt holes in the transom should correspond with those in the chassis.

Now lower the racer to the rollers as before. Before mounting the top carriage see that the recoil rollers are perfectly clean and that the pockets are free from sand. On account of the clips engaging over flanges on the chassis rails, the top carriage must be mounted from the rear. Raise it on blocking until it is high enough to engage and slide over the chassis rails. Move it forward on rollers, taking care to keep it at the same inclination as the chassis rails

so that it will not bind. If the piston rods are assembled to the top carriage, they may be pushed through the holes in the lugs on the front of the chassis and secured by the two piston-rod nuts. If they are not assembled, they should be thoroughly cleaned and then inserted into the cylinder from the rear.

**TRAVERSING MECHANISM.**—Assemble to the front guide hook the traversing sprocket-wheel shaft with the sprocket wheel at the lower end and the bevel gear at the upper end properly keyed, after which bolt the front and rear guide hooks to the racer. Put in the spur-gear shaft from the outside with bevel gear inside and spur gear outside properly keyed. Insert the traversing-crank shaft with the pinion on the right side properly keyed on and put on the traversing cranks. The traversing chain may now be assembled and the guide pulleys attached to the front guide hook. *Be careful to have the traversing chain without kinks or twists.*

**ELEVATING MECHANISM.**—Assemble the elevating apparatus, beginning at the top with the parts on the top carriage, and place the bearings, shafts, and gears in their proper places, putting in the miter gear which moves with the top carriage before the side shaft is assembled.

**RETRACTING MECHANISM.**—Bolt the retracting hooks in their respective places, if not already on the carriage, place the worm shaft, the wormwheel, and the retraction drum shaft brackets in position and assemble the drums, wormwheel shafts, worm, and gears in their proper places, being careful that the keys and headless screws are properly located.

**PROJECTILE HOIST.**—Assemble the projectile-hoist crank shaft with its drum, pawl bracket, and pawl. Mount the crane in its step and assemble its sheaves and hoisting tackle. Pass the end of the rope through a hole in the drum and fasten it on the inside.

**LOADING PLATFORM AND OTHER PARTS.**—Bolt the loading platform to the chassis and assemble all minor parts.

**AFTER ASSEMBLING.**—After the carriage is completely assembled, the gun mounted, and the cylinders are filled with oil, retract the top carriage and allow it to go into battery several times to see that everything works properly.

**SPECIAL POINTS TO BE NOTED.**—After the carriage has been completely assembled and the gun mounted, note that—

1. All bearing surfaces are thoroughly cleaned and lubricated, including the pintle surfaces and the teeth of all gears.
2. The traversing rollers all bear.
3. The recoil rollers turn freely by hand and their recesses are clean.
4. All oil holes are clean and free from grit and properly closed with screw plugs.

5. There are no burrs on the chassis rails to interfere with the motion of the top carriage.

6. The teeth of all traversing, elevating, retracting, and projectile-hoist gears are in good condition.

7. The stuffing boxes of the recoil cylinders are properly packed

8. The bolts through the walls of the recoil cylinders engaging the throttling bars are properly set up; also all filling plugs.

9. All pipe connections are properly set up and are tight.

10. The base ring of the carriage is level. This can be tested by traversing the carriage throughout its extent with a clinometer placed at the muzzle.

11. The name plate and direction plates are properly placed on the carriage.

12. The azimuth pointer remains in smooth contact with the azimuth circle while the carriage is traversed and all graduations are properly and neatly numbered.

13. The traversing rollers and paths are clean and free from rust.

14. The leveling screws of the carriage are in place and backed off so as not to bear on the thrust plates.

15. The elevation indicator is properly attached and correctly graduated.

16. The stops limit the motion in azimuth.

### CARE OF THE CARRIAGE.

Carriages should be traversed from time to time throughout their entire allowed movement. The habitual position of guns on barbette carriages is "in battery," but at intervals the gun should be retracted and allowed to run again into battery, and should be elevated and depressed within the limits.

It is especially required that all parts of carriages be kept free from rust *at all times*. If this be allowed to accumulate its removal from all bearing parts, and especially piston rods, requires particular attention in order that clearances shall not be unduly increased.

The use of sandpaper for this purpose is forbidden, and emery cloth No. 1, being coarse enough for any ordinary rusting, should be used, the rust being softened, if necessary, by kerosene.

**TO PACK OR REPACK A STUFFING BOX.**—Examine the old packing and discard all unfit for use. If any of the old packing is used it should be put in after the new. See that the stuffing boxes are well cleaned and oiled.

Put on the piston rod one ring of 0.875-inch Garlock's "waterproof hydraulic" packing and force it well to the bottom of the stuffing box by a wooden stick and mallet. Treat each layer of packing in a similar manner, being careful to break joints until six rings of new pack-

ing have been inserted, or an equal amount of new and old when any of the latter is used. Place the gland on the follower, enter them together in the box, and screw up the follower.

*No more force should be used on the spanner wrench than that of two men, and generally that of one man is sufficient. The addition of a pipe to the end of the spanner wrench should not be permitted.*

The follower should be tightened from time to time. If the follower is screwed into the stuffing box too tightly, an unnecessary amount of friction will be produced on the friction rod. When the follower is screwed in until the flange strikes the box another ring of packing should be inserted.

It is to be expected that a slight amount of oil will soak through and drip from boxes of carriages when not in use. Also when tightening the followers a slight amount of oil will squeeze out of the saturated packing. This oil should be caught in the drip pan and not allowed to render the carriage unsightly.

**TO REMOVE PACKING FROM A STUFFING BOX** (using new extractor furnished by the Ordnance Department).—Retract the top carriage about 3 feet, unscrew the follower, and extract the gland, then close the extractor around the piston and insert the locking pin. When the needles or hooks are in contact with the packing turn the extractor to the *left*, pressing lightly downward at the same time, until the needles are firmly engaged in the packing. Then pull back on the handles of the extractors, still turning slowly to the *left*, until the packing reaches the threads of the stuffing box, when, unless the packing is quite loose, its further removal should be accomplished by unscrewing and so following the thread. It should be noted that the packing has been set hard against the walls of the stuffing box and the piston rod, and it will catch on the threads of the former, so that unless removed by unscrewing, as described, the packing is likely to be injured.

Extracting bars are provided to be used for starting the packing from its seat and steps are formed on the extractor in which the toes of the bars can engage.

**FILLING RECOIL CYLINDERS.**—The top carriage should be “in battery.” To fill the cylinders with oil, remove for this purpose the four plugs, two in each cylinder. The rear ones on each cylinder are the vent plugs, and those directly in front of the vent plugs are the filling plugs. Pour clean neutral oil of specific gravity about 0.85 (such as the “hydroline” now issued to the service) into the filling hole in one cylinder until it flows out of the hole in the other. Allow any air that may be present to escape, then pour in more oil until the system is filled, and replace all plugs. About 34 gallons of oil are required. The working pressure in the cylinders is about 1,540 pounds per square inch.

**INSTRUCTIONS FOR CLEANING RECOIL CYLINDERS.**—Remove oil from cylinders and equalizing pipes.

Retract the gun until the pistons are in the middle of the cylinders; place hardwood planks 1 inch thick between the front ends of the cylinders and the counter-recoil stops so as to positively retain the top carriage in this position. Care should be taken that both planks are of equal length.

Remove the cylinder heads and both piston-rod nuts and carefully withdraw the piston rods from the cylinders. Each part dismounted should be tagged to insure its being assembled in its correct place.

Thoroughly clean the cylinders with kerosene oil forced from a hand pump into both ends of each cylinder. The plug in the emptying coupling should be removed and both branches of the equalizing pipe flushed out from their cylinder ends.<sup>1</sup> Then wipe the interior of the cylinders dry with clean cotton waste and clean the piston rods and cylinder heads.

Replace the emptying coupling plug, assemble the piston rods, nuts, and cylinder heads, exercising great care that none of the parts are burred or otherwise damaged. The cylinder heads should be firmly screwed into place, care being taken that the packing ring is in good condition and properly placed. Screw the followers tight against the packing in the stuffing boxes.

All parts dismounted should be carefully inspected to ascertain that they have been properly assembled. Retract the top carriage until both planks can be removed, then, by means of the retracting gear, allow the gun to return slowly into the firing position. After the cylinders have been filled with oil the gun should be retracted and allowed to run into battery several times to insure that all parts are in good working order.

**SERVICE CONDITION (LUBRICATION, ETC.).**—When the carriage is to be kept in readiness for service, and is in daily or frequent use, all bearing parts must be kept thoroughly cleaned and lubricated. Especial attention should be given to the lubricating of gun trunnions, rollers, pintle surfaces, shaft axle bearing, and sliding surfaces, and the elevating, traversing, hoisting, and retracting mechanisms, including the teeth of all gears.

*The above parts should be lubricated at frequent intervals, whether the carriage is maneuvered or not, and it is essential for the proper preservation and working of the carriage that on every day on which it is to be maneuvered for any purpose all bearings should be well lubricated immediately before such maneuvering.*

<sup>1</sup> In carriages Nos. 2 to 10, inclusive, a cored equalizing passage connects the pressure ends of the cylinders. In these carriages the emptying plug at the middle of this passage should be removed and both parts of the passage flushed out as in the case of the equalizing pipe.

It will occasionally be necessary to examine all roller bearings to see that the dust guards are in proper place and that the rollers themselves are clean.

**RECOIL CYLINDERS.**—Experience has indicated that the oil should not be removed from the recoil cylinders when carriages are to remain unused for a considerable period, as the walls of the cylinders soon become dry and then rust.

**OIL HOLES.**—Oil holes, where provided, must be cleaned out frequently to keep them free from sand and grit, and will habitually be kept closed by the screw plugs provided, except when in the act of oiling.

*Before oiling at any oil hole, wipe off carefully any dirt or grit near the opening that might be carried down into the bearing by the oil.*

**COMPRESSION GREASE CUPS.**—Where compression grease cups are provided, similar precautions against dirt or grit must be observed. In filling these cups fill only to the bottom of the bevel at the top of the cup; if too full, the leather packing will not act effectively. In putting on the cap see that the leather-packed follower enters the cup without being caught, cut, or bent by the edge of the cup. Screw the cap down on the cup until the spring rod projects about  $\frac{1}{4}$  inch above the top of the cap. Later, when the spring has recovered and has moved the follower forward, forcing the grease through the tube into the bearings, which will be indicated by the spring rod being pulled into the cap until its nut touches or nearly touches the cap, it will again be necessary to screw up the cap on the cup until the spring is again compressed. When the cap is screwed nearly home and the spring rod does not project, it is an indication that the cup should be refilled.

For further information regarding paints, oils, cleaning materials, and methods of using same, see Ordnance Department pamphlet, Form No. 1869.

*List of articles packed in the armament chest for 10-inch gun, model of 1888, and barbette carriage, model of 1893.*

#### FOR GUN.

- 1 bar screw driver for breech-plate screws.
- 3 bar screw drivers for breech mechanism.
- 1 tool for housing of crank catch.
- 1 obturator nut wrench.
- 1 obturator nut clamp screw wrench.
- 1 cleaning reamer for primer seat, 3 cleaning brushes for primer seat, in firing mechanism box.
- 1 pin punch.
- 1 tit wrench for obturator spindle.
- 1 pressure plug wrench.
- 1 ring for lifting breech-plate screws.

*List of articles packed in the armament chest for 10-inch gun, model of 1888,  
and barbette carriage, model of 1893—Continued.*

- 1 bronze drift, large.
- 1 bronze drift, small.
- 1 gunner's punch.
- 1 gunner's drill.
- 1 gunner's pouch.
- 1 pair gunner's sleeves.
- 1 gunner's lanyard.
- 1 metal scraper.
- 4 balls twine, assorted.
- 2 pounds copper wire, No. 12.
- 2 pounds copper wire, No. 16.
- 1 quire emery cloth, No. 00.
- 3 wagon sponges.
- 1 file, flat, dead smooth, 8-inch.
- 1 file, round, second cut, 8-inch.
- 1 file, half round, smooth, 8-inch.
- 1 file, 3-cornered, 8-inch.
- 1 copper hammer.
- 1 boiler-maker's hammer.
- 1 hand mallet.
- 1 long-handled mallet.
- 1 pair cutting pliers.
- 1 monkey wrench, 18-inch.
- 1 monkey wrench, 12-inch.
- 10 pounds cotton waste.
- 3 files, pillar, No. 6, 6-inch; 3 files, three cornered, No. 4, 6-inch; 3 files, half round, smooth, 8-inch; and 3 files, round, smooth, 8-inch, for use on bruised breech blocks; no other files to be used thereon.
- 1 box containing firing mechanism.
- 1 loading tray.
- 3 cleaning brushes for primer seat (in F. M. box).

FOR CARRIAGE.

- 1 spanner wrench for stuffing box gland.
- 1 box wrench for friction clamp nuts.
- 1 box wrench for elevating rack.
- 1 double wrench for chain connection and throttling bars.
- 1 bar wrench for rear cylinder head.
- 1 double wrench for  $\frac{1}{2}$  and  $\frac{3}{4}$  inch nuts.
- 1 double wrench for  $\frac{7}{8}$  and 1 inch nuts.
- 1 double wrench for  $\frac{1}{2}$  and  $1\frac{1}{2}$  inch nuts.
- 1 single wrench for  $1\frac{1}{4}$ -inch nuts.
- 1 single wrench for  $1\frac{1}{2}$ -inch nuts.
- 1 single wrench for  $1\frac{3}{4}$ -inch nuts.
- 1 single wrench for 2-inch nuts.
- 1 single wrench for  $2\frac{1}{2}$ -inch nuts.
- 1 screw driver, commercial.
- 2 screw eyes for extracting follower in stuffing box.
- 1 screw driver for dust guard.
- 1 screw driver for journal of recoil roller.
- 1 crane block and rope.

*List of articles packed in the armament chest for 10-inch gun, model of 1888,  
and barbette carriage, model of 1893—Continued.*

1 oiler, locomotive, 1-quart.

1 oiler,  $\frac{1}{2}$ -pint.

The following articles being too large are not to be kept in the chest:

1 box wrench for guide hooks.

2 wrenches for piston rod nuts.

2 water buckets, indurated fiber.

GASKETS AND PACKING.

1 set of gaskets for carriage.

12 rings Garlock's waterproof hydraulic packing 0.875 inch square and 4 inches inside diameter.

*Weights of parts of 10-inch barbette carriage, model of 1893.*

Num- ber.	Name of parts.	Material.	Weight.
			<i>Pounds.</i>
1	Base ring.....	Gun iron.....	26,680
1	Racer.....	Cast steel, No. 1.....	19,345
2	Chassis.....	Cast steel, No. 2.....	15,048
1	Top carriage.....	do.....	9,157
	Elevating mechanism—		
1	Rack.....	Bronze, No. 3.....	90
1	Rack pinion.....	Forged steel, No. 3.....	15
1	Wormwheel.....	Bronze, No. 1.....	70
1	Wormwheel shaft.....	Steel.....	27
1	Worm.....	Forged steel, No. 3.....	31
1	Worm shaft.....	Steel.....	36
6	Miters.....	Bronze, No. 1.....	50
1	Vertical shaft for miter.....	Steel.....	15
1	Side shaft.....	do.....	70
1	Friction clamp.....	Forged steel, No. 2.....	16
1	Crank shaft.....	Steel.....	150
2	Cranks.....	Wrought iron.....	40
	Traversing mechanism—		
1	Chain.....	do.....	160
1	Sprocket wheel.....	Cast iron.....	61
1	Sprocket wheel shaft.....	Steel.....	58
2	Bevel gears.....	Bronze, No. 1, and steel, No. 2...	97
1	Spur wheel shaft.....	Steel.....	50
1	Spur wheel.....	Bronze, No. 1.....	80
1	Spur pinion.....	Steel, No. 2.....	20
1	Crank shaft.....	Steel.....	140
2	Cranks.....	Wrought iron.....	40
2	Chain guide wheels.....	do.....	28
1	Front guide hook.....	Cast steel, No. 1.....	450
2	Chain connections.....	Forged steel.....	16
	Hoisting mechanism—		
1	Crane mast.....	Wrought iron.....	325
1	Block.....	Bronze and wrought iron.....	20
1	Drum.....	Cast iron.....	95
1	Drum shaft.....	Steel.....	24
1	Pinion.....	do.....	18
1	Crank shaft.....	do.....	23
1	Pawl.....	Wrought iron.....	8
1	Crank.....	do.....	19
1	Spur gear.....	Bronze.....	36
1	Ratchet wheel.....	do.....	8
20	Traversing rollers.....	Forged steel, No. 3.....	2,860
20	Recoil rollers.....	do.....	2,695
20	Recoil roller journals.....	do.....	375
1	Rear guide hook.....	Cast steel, No. 1.....	240
2	Piston rods.....	Forged steel, No. 3.....	785
1	Piston rod nut.....	do.....	50
2	Stuffing boxes.....	Bronze, No. 1.....	310
2	Rear cylinder heads.....	Cast steel, No. 2.....	284
4	Throttling bars.....	Forged steel.....	140
2	Distance rings.....	Wrought iron.....	750
10	Distance ring braces.....	Cast iron.....	130
2	Dust guards.....	Wrought iron.....	200
1	Racer cover.....	do.....	48
1	Loading platform.....	Steel plate.....	2,576
1	Sliding platform.....	do.....	475
1	Front transom.....	Steel, No. 1.....	610
	Bolts, nuts, etc.....		1,310
	Total weight of carriage.....		77,454



*Names of the parts of the 10-inch barbette carriage, model of 1893, with their location and the material of which they are made.*

Name of part.	Location.	Material.	Num- ber.	Diam- eter.	Length.	Nuts.	Remarks.
Azimuth circle.	Base ring.	Brass.	1	Inches.	Inches.		
Azimuth pointer.	Azimuth pointer bracket.	do.	1				
Azimuth pointer bracket.	Racer.	Steel.	1				
Base ring.	On concrete platform.	Gun iron.	1				
Bolts, hexagonal head.	Plug for filling holes.	Wrought iron.	2	1.25	2		Copper washers.
Do.	Retraction drum shaft bracket and wormwheel bracket.	do.	8	1	2.75		
Do.	Trunnion cap to top carriage.	do.	4	1.25	3.75		
Do.	Emptying coupling to top carriage.	do.	2	.75	1.5		
Do.	Retraction worm shaft bracket.	do.	2	1	2.5		
Do.	Chassis to racer.	do.	10	1.75	4.25		
Do.	do.	do.	4	1.75	4.5		
Do.	do.	do.	2	2	4.25		
Do.	Bearing for crank shaft of elevating apparatus to racer.	do.	4	1	2.375		
Do.	Retraction wormwheel to drum.	do.	6	.75	1.5		Front.
Do.	Guide hooks to racer.	Steel.	6	1.625	5.875		Rear.
Do.	do.	Wrought iron.	4	1.625	6.875		
Do.	Bracket for loading platform to chassis.	do.	24	.875	2		
Do.	Elevation disk case to top carriage.	Steel.	4	.75	2.375		Fitted.
Do.	Elevation disk cover to elevation disk case.	do.	6	.5	1.5		
Do.	Gear segment to gun trunnion.	do.	3	.875	3		
Do.	Retraction miter gears and shaft collars.	do.	4	.5	.875		
Do.	Brackets for square shaft to chassis.	Wrought iron.	4	.875	2.625		
Do.	do.	do.	4		over all.		
Do.	Retraction hook to chassis.	do.	6	.875	2.375		
Do.	do.	do.	6	1	3.25		
Do.	Transom to chassis.	do.	2	1	2.5		
Do.	Braces for loading platform to chassis.	do.	12	1.25	3		
Do.	Retraction hook to top carriage.	do.	4	1.25	2.5		
Do.	Loading platform to chassis.	do.	4	1.25	3		
Do.	do.	Steel.	8	.875	1.625		
Do.	Loading platform to bracket.	Wrought iron.	24	.75	1.5		
Do.	Railing to platform.	do.	24	.75	2.125	24	
Do.	Throttling bars to cylinders.	do.	48	.625	1.125		
Do.	Elevating rack to gun.	Steel.	36	.75	3.625		See details.
Do.	do.	do.	2	1.125	4.25		8 threads per inch.
Do.	Leveling screws.	do.	2	1.125	3.75		Do.
Do.		Bronze, No. 3.	8				See details.

*Names of the parts of the 10-inch barbelite carriage, model of 1893, with their location and the material of which they are made—Continued.*

Name of part.	Location.	Material.	Num- ber.	Dia-me- ter.	Length.	Nuts.	Remarks.
Bolts, hexagonal head.	Stand for chassis sight to chassis.	Wrought iron.	4	Inches. 0.75	Inches. 1.875	.....	
Do.....	Axis with pointer bracket to chassis.	do.	4	.....	1.75	.....	
Do.....	Step hanger to racer.	do.	4	.....	1.75	.....	
Bolts, square head.	Chassis to racer.	do.	14	1.75	6.25	14	
Do.....	do.	do.	4	1.75	6.15	4	
Do.....	Lower bracket for vertical shaft to chassis.	do.	1	1	5.125	.....	
Do.....	Upper bracket for vertical shaft to chassis.	do.	2	1.125	5.125	2	
Do.....	Braces for leading platform to plate.	do.	4	.875	3.5	4	
Do.....	Step braces to platform.	do.	16	.75	1.875	16	
Do.....	Trailing braces to platform.	do.	8	.75	1.875	8	
Do.....	End brace to platform.	do.	8	.625	1.75	8	
Do.....	do.	do.	8	.625	2.25	8	
Do.....	Guard for sliding plate to platform.	do.	2	.5	3.25	2	
Do.....	Platform plate to platform.	do.	14	.5	1.625	14	
Do.....	Steps to step hanger.	Steel.	4	.75	1	.....	
Bolts, round head.	Retraction blocks.	do.	8	1.75	.....	.....	8 0.875-inch nuts; bolts special.
Do.....	do.	do.	4	.....	.....	4	2.5 by 2.5 by 0.5 inch angles.
Braces for chassis sight platform.	Leading platform.	do.	2	.....	.....	.....	Fastened to outer cheeks by 0.19
Braces.	Retraction blocks.	do.	8	.....	.....	.....	inch rivets.
Do.....	Distance ring.	Cast iron.	10	.....	.....	.....	
Bushing.	Crane crank shaft on chassis.	Bronze.	2	.....	.....	.....	
Do.....	Crane drum shaft on chassis.	do.	2	.....	.....	.....	
Do.....	Crane mast on chassis.	do.	2	.....	.....	.....	
Do.....	Elevating crank shaft bracket.	Bronze, No. 1	2	.....	.....	.....	
Do.....	Front guide hook.	do.	3	.....	.....	.....	
Do.....	Top carriage and cap squares.	Bronze.	2	.....	.....	.....	
Do.....	Recoil rollers.	Bronze, No. 1	20	.....	.....	.....	Made in halves and secured by 16
Do.....	Retraction drum shaft bracket.	Bronze.	1	.....	.....	.....	0.75-inch countersunk screws.
Do.....	Retraction worm shaft bracket.	do.	1	.....	.....	.....	
Do.....	Elevating square shaft bracket.	Bronze, No. 1	2	.....	.....	.....	
Do.....	Traversing crank shaft, chassis.	Bronze.	2	.....	.....	.....	
Do.....	Traversing spur wheel, shaft chassis.	do.	1	.....	.....	.....	
Do.....	Lower vertical shaft bearing.	Bronze, No. 1	1	.....	.....	.....	
Do.....	Upper vertical shaft bearing.	do.	1	.....	.....	.....	
Do.....	Worm shaft, top carriage.	Bronze.	2	.....	.....	.....	
Do.....	For retraction drum in wormwheel bracket.	do.	1	.....	.....	.....	
Do.....	For retraction wormwheel shaft in wormwheel bracket.	do.	2	.....	.....	.....	
Do.....	Wormwheel shaft, top carriage.	do.	2	.....	.....	.....	

[illegible]

*Names of the parts of the 10-inch barbettes carriage, model of 1898, with their location and the material of which they are made—Continued.*

Name of part.	Location.	Material.	Num- ber.	Diam- eter.	Length.	Nuts.	Remarks.
Elevating cranks.	On elevating crank shaft.	Wrought iron.	2				
Elevating crank shaft.	In bearings on racer.	Cold-rolled steel.	1				
Elevating crank shaft bearings.	Racer.	Cast steel, No. 1.	2	2	122		Sleeves, brass tubing 1 0.4376 by 0.625 by 4.125 inch key.
Elevating crank shaft collars.	On elevating crank shaft.	Forged steel.	2				2 0.5-inch set screws.
Elevating friction clamp.	Elevating worm wheel.	Forged steel, No. 3.	1				
Elevating miters.	On shafts.	Bronze, No. 1.	5				4 0.75 by 1 inch headless screws, 15 teeth, 1.25-inch pitch.
Elevating miter gear.	On square side shaft.	do.	1				15 teeth, 1.25-inch pitch.
Elevating miter gear collar.	On miter gear.	do.	1				1.025-inch taper pin.
Elevating rack.	On gun.	Bronze, No. 3.	1				174 teeth on the circle, 1.75-inch pitch.
Elevating rack pinion.	On worm wheel shaft.	Forged steel, No. 3.	1				11 teeth, 1.75-inch pitch.
Elevating side shaft.	In bearings on right chassis.	Cold-rolled steel.	1	2	84.8		1 0.4376 by 0.625 by 2.35 inch key.
Elevating square shaft bearings.	Right chassis.	Cast steel, No. 1.	2				2 0.5-inch set screws.
Elevating side shaft collar.	One side shaft.	Steel.	1				
Elevating vertical shaft for miters.	In bearings on chassis.	Cold-rolled steel.	1	2	17.5		
Elevating vertical shaft bearing, lower.	Right chassis.	Cast steel, No. 1.	1				
Elevating vertical shaft bearing, upper.	do.	do.	1				
Elevating worm.	On elevating worm shaft.	Forged steel, No. 3.	1				Right-hand, 1.5-inch pitch.
Elevating worm shaft.	In bearings on top carriage.	Cold-rolled steel.	1		33.9		1 0.4376 by 0.625 by 2.35 inch key, 1 0.75 by 1 inch headless screw, 1 0.4376 by 0.625 by 0.9025 inch key.
Elevating worm shaft nut.		Steel.	1				1.5 inches diameter by 1 inch high.
Elevating worm shaft ball bearings.	Elevating worm shaft.	Tool steel.	2				4 washers, 2 brass rings shrunk on. Diameter of balls, 0.23 inch.
Elevating worm shaft collar.	On elevating worm shaft.	Forged steel.	1				Taper pin.
Elevating worm shaft collar pin.	On elevating worm shaft and collar.	Steel.	1				33 teeth, 1.5-inch pitch.
Elevating worm wheel.	On elevating worm wheel shaft.	Bronze, No. 1.	1		26		1 0.4376 by 0.625 by 1.4376 inch key, 1 0.4376 by 0.625 by 2 inch by 1 inch headless screw.
Elevating worm wheel shaft.	In bearings on top carriage.	Cold-rolled steel.	1				2 by 1.5 inches high.
Elevating worm wheel shaft nut.	On elevating worm wheel shaft.	Steel.	1				
Elevation disk.	On elevation disk hub.	White metal.	1				
Elevation disk case.	On top carriage.	Cast iron.	1				
Elevation disk case cover.	On elevation disk case.	do.	1				
Elevation disk hub.	On pinion.	do.	1				
Elevation stop.	On top carriage.	Bronze, No. 2.	1				
Emptying plug.	Underneath top carriage.	Forged steel.	1	.75	1.25		Riveted on elevation disk. Square washer head. Carriages 2 to 10, inclusive.
Emptying coupling.	Between equalizing pipes.	do.	1				For carriages No. 1 and No. 11.

Emptying coupling unions.....	Connecting equalizing and emptying couplings.....	Bronze.....	2	2	Do.
Emptying coupling rings.....	.....do.....	Steel.....	2	2	Do.
Emptying coupling washer.....	.....do.....	Vulcanized fiber.....	2	2	10 threads per inch.
Emptying coupling drain plug.....	Emptying coupling.....	Bronze.....	1	1	For carriages No. 1 and No. 11.
Emptying coupling nipple.....	.....do.....	.....do.....	1	1	Do.
Equalizing pipe.....	On top carriage connecting recoil cylinders.....	Copper pipe.....	2 pos.	2 pos.	About 4 feet long, $\frac{1}{4}$ inch inside and 0.8125 inch outside diameter.
Equalizing pipe packing ring.....	Equalizing pipe.....	Steel.....	2	2	
Equalizing pipe reducing plugs.....	.....do.....	Bronze.....	2	2	
Equalizing pipe unions.....	.....do.....	Vulcanized fiber.....	2	2	
Equalizing pipe washer.....	.....do.....	Carlock waterproof hydraulic pac. ing.	2	2	
Equalizing pipe connection pac ing.....	Top carriage.....	Wrought iron.....	2	2	
Extractors, screw eye.....	For extracting gland in stuffing box.....	Flexible vulcanized fiber.....	2	2	
Gasket.....	Rear cylinder head.....	.....do.....	2	2	
Do.....	Stuffing box.....	Cast steel.....	2	2	270 teeth in complete circle.
Gear segment.....	On gun trunnion.....	Bronze.....	1	1	1 cap U. S. standard threads, 8 per inch.
Grease cups.....	Top carriage.....	.....do.....	2	2	
Grease cup covers.....	.....do.....	.....do.....	2	2	2 0.125 by 1.375 inch split pin. 2 0.3125 by 0.5 screws.
Grease cup pistons.....	On grease cup piston.....	Steel.....	2	2	
Grease cup springs.....	.....do.....	Bronze.....	2	2	
Grease cup piston washer.....	Fastened to piston.....	Leather.....	2	2	Cup leather.
Grease cup pac. ing.....	Top carriage.....	Seamless brass tubing.....	2	2	0.25-inch wrought-iron pipe size, beaded, malleable-iron elbow.
Grease cup pipe.....	Grease cup seat in top carriage.....	Copper.....	4	4	
Grease cup pipe gaskets.....	Racer.....	Cast steel, No. 1.....	1	1	
Guide hook, front.....	.....do.....	Wood.....	1	1	
Guide hook, rear.....	With carriage.....	Bronze, No. 3.....	8	8	
Implement box.....	Base ring.....	Steel.....	2	2	
Implement box.....	Under base ring for leveling screws.....	.....do.....	8	8	
Leveling screws.....	Guides on top carriage.....	Tobin bronze.....	1	1	
Leveling thrust plate.....	On chassis.....	Rolled iron.....	1	1	Fastened by means of 88 0.3125-inch screws
Liners.....	Chassis.....	Cast steel, No. 1.....	4	4	
Leading platform.....	On leading platform.....	Wrought iron.....	6 sec.	6 sec.	1-inch wrought-iron pipe.
Leading platform brace.....	Leading platform.....	Steel.....	2	2	
Leading platform handrails.....	Leading platform and chassis.....	Wrought iron.....	2	2	
Leading platform steps.....	Leading platform.....	Steel.....	2	2	
Leading platform step braces.....	.....do.....	.....do.....	2	2	
Leading platform cross braces.....	.....do.....	.....do.....	2	2	
Leading platform frame.....	Chassis.....	.....do.....	4	4	
Leading platform gusset plate.....	Leading platform frames.....	.....do.....	4	4	
Leading platform guide plate.....	Leading platform.....	.....do.....	1	1	3 by 5 by $\frac{1}{4}$ inch angle.
Leading platform filler piece.....	At rear of leading platform.....	Wrought iron.....	2	2	
Leading platform anchor.....	Leading and chassis sight platforms.....	Bronze.....	12	12	Solid forgings.
Name plate.....	Leading chassis.....	Bronze.....	1	1	1-pint.
Oil can.....	Right chassis.....	Brass.....	1	1	1-quart.
Oil can with valve.....	With carriage.....	.....do.....	1	1	

*Names of the parts of the 10-inch barbette carriage, model of 1898, with their location and the material of which they are made—Continued.*

Name of part.	Location.	Material.	Num- ber.	Diam- eter.	Length.	Nuts.	Remarks.
Oil plugs.....	In carriage.....	Bronze.....	28	Inches. 0.375	Inches. 1		Driven. 18 teeth. Fastened by 56 0.3125-inch counter- sunk screws.
Pinion.....	Elevation disc to pinion.....	Steel.....	22	.625			
Pinion.....	On pivot.....	Forged steel.....	4	.437			
Piston cover.....	On piston.....	Bronze.....	1				
Piston head.....	Piston rod.....	Forged steel, No. 3.....	2				Do.
Piston liner.....	Pistons.....	Bronze.....	16				10 threads per inch.
Piston rods.....	In recoil cylinders.....	Forged steel, No. 3.....	2	4	93		2 3.5 inches diameter by 3 inches high, 2 3.5 inches diameter by 2 inches high; 10 threads per inch.
Piston rods nut.....	On piston rods.....	do.....	4				1 Std. 625 nut at small end. These plugs are used for permanent closing.
Pivot.....	Front on top carriage.....	Steel.....	1	1.9	6.875		Method of permanently closing cav- ities in case of damage to equaliz- ing pipe. For carriages No. 1 and No. 11.
Plugs for cored equalizing pipe.....	Equalizing pipe connection cavities.....	Wrought iron.....	2				
Plugs, cylinder.....		Bronze, No. 4.....	3				
Platform for chassis sight.....	Loading platform.....	Steel.....	1				2 German silver strips pinned in place.
Pointer.....	On elevation disk case.....	Bronze.....	1				.25 per foot taper.
Pointer dowel.....	Pointer to elevation disk case.....	Steel.....	2	.187(11)	1		
Pointer screw.....	do.....	Bronze.....	2	.6	1		
Racer.....	On traversing rollers.....	Cast steel, No. 1.....	1				Fastened to racer by 0.625-inch countersunk screws.
Racer cover.....	On racer.....	Wrought iron.....	9				6 threads per inch.
Rear cylinder head.....	In recoil cylinder.....	Cast steel, No. 2.....	2				8 threads per inch.
Recoil rollers.....	Pockets in chassis.....	Forged steel, No. 3.....	20				
Recoil roller journals.....	In chassis.....	do.....	20	2.5	12		
Retraction blocks.....	With carriage.....	Steel.....	4				
Retraction block sheaves.....	In retraction blocks.....	Bronze, No. 3.....	8				
Retraction crank.....	On retraction crank shaft.....						No special crank. The elevating cranks are used.
Retraction crank shaft.....	In bearings on chassis.....	Steel.....	1		115		
Retraction crank shaft bushing.....	In chassis.....	Bronze.....	2				
Retraction crank shaft collar.....	On retraction crank shaft.....	Steel.....	1				1 0.5-inch set screw, hexagonal head, 0.5 by 0.5 by 0.15 inch key, Right and left.
Retraction drums.....	On retraction drum shaft.....	Bronze, No. 3.....	2				20.8 by 0.5 by 3 inch keys, 2 0.75 by 1 inch headless screws.
Retraction drum shaft.....	In drum shaft bracket.....	Steel.....	1				

Retraction drum shaft bracket.....	On racer.....	Cast iron.....	1	1	Right and left.
Retraction hook, front.....	On top carriage.....	Cast steel, No. 2.....	2	2	Do.
Retraction hook, rear.....	On chassis.....	do.....	2	2	22 teeth, 4-pitch, 2 0.5-inch set screws.
Retraction miter gears.....	On shafts.....	Steel.....	1 pr.	2	0.625 galvanized W. I. hook and
Retraction rope.....	In blocks.....	Manila.....	2	2.25 cfr.	thimble, commercial, copper wire
					used for seizing rope.
Retraction worm.....	On retraction worm shaft.....	Steel, No. 3.....	1	1	Triple right-hand threads, 2-inch
Retraction worm shaft.....	In worm shaft bracket and worm-wheel bracket.....	Steel.....	1	1	lead, 10.3 by 0.3 by 6.5 inch key.
Retraction worm shaft bracket.....	On racer.....	Cast iron.....	1	1	1 0.5 by 0.5 by 2.75 inch key.
Retraction worm shaft collar.....	On retraction worm shaft.....	Steel.....	1	1	
Retraction wormwheel.....	On left retraction drum.....	Bronze, No. 3.....	1	1	0.3-inch key fixed in collar; 1 0.5-inch
Retraction wormwheel bracket.....	On racer.....	Cast iron.....	1	1	set screw.
Retraction wormwheel bracket cover.....	Wormwheel shaft.....	Steel plate, A. W. G., No. 6.....	1	1	60 teeth, triple right-hand worm ;
Rivets.....	Piston liner and head.....	Brass.....	16	.375	circular piston.
Do.....	Elevation disk to elevation disk hub.....	Bronze.....	12	.375	
Roller path (upper).....	On lower roller path.....	Cast steel No. 1.....	1	1	
Roller path (lower).....	Emplacement.....	Gun iron.....	1	1	
Screw driver, wooden handle.....	With carriage.....	Steel, hardened.....	1	1	
Screw driver.....	With carriage, for dust guard.....	Wrought iron.....	1	1	
Do.....	With carriage, for record roller journal.....	do.....	10	14.875	
Screws, chesshead.....	Distance rings, together.....	do.....	68	1.375	
Screws, countersunk.....	Covers to racer.....	do.....	1	.625	10 Heads, 0.5 inch high.
Do.....	Lining of lateral bearing on top carriage.....	Tobin bronze.....	88	.3125	
Do.....	Guard for sliding plate to platform.....	Wrought iron.....	2	.75	
Do.....	Guides for sliding plate to platform.....	do.....	18	.75	
Do.....	do.....	do.....	22	.3125	Screw.
Do.....	Platform plate to T.....	do.....	14	.75	14
Do.....	Bushing to trunnion bed.....	Brass.....	16	.75	
Do.....	Piston cover to piston.....	do.....	56	.3125	
Do.....	Guide wheel stud to front guide hook.....	Steel.....	1	.5	
Do.....	Direction plates.....	Brass.....	16	.25	
Draws, headless.....	Retraction drum to shaft.....	Steel.....	2	.75	
Do.....	Shaft for sprocket wheel.....	do.....	2	.75	
Do.....	Piston.....	do.....	2	.75	
Do.....	Miter gears and elevating pulley.....	do.....	5	.75	
Do.....	Pivot to elevation disk case.....	do.....	1	.625	
Do.....	Pinion to elevation disk hub.....	do.....	2	.312(4)	.625

*Names of the parts of the 10-inch barbette carriage, model of 1893, with their location and the material of which they are made—Continued.*

Name of part.	Location.	Material.	Num-ber.	Diam-eter.	Length.	Nuts.	Remarks.
Screws, round head.....	Worm-wheel bracket cover.....	Wrought iron.....	8	Inches. 0.375	Inches. 0.75	.....	
Do.....	Traversing stops and rear guide hook.....	Steel.....	2	1.25	2.5	.....	
Do.....	Dust guard to racer.....	Wrought iron.....	40	.375	1	.....	
Do.....	Collars to elevating crank shaft.....	Steel.....	2	.5	.875	.....	
Do.....	Collars to traversing side shaft.....	do.....	2	.5	.875	.....	
Do.....	Collar to traversing crank shaft.....	do.....	1	.5	.875	.....	
Do.....	Bracket for guide sheave, together.....	Wrought iron.....	2	.75	2.25	1	
Do.....	Bracket for sliding plate.....	do.....	1	1.5	6.625	2	
Do.....	Sliding plate connection to top carriage.....	do.....	2	1.5	6.625	.....	
Do.....	Azimuth pointer.....	Brass.....	2	.375	.75	.....	
Separators (braces).....	Between distance rings.....	Cast iron.....	10	.....	.....	.....	
Separators, front blocks.....	Retraction blocks.....	Steel.....	4	.....	.....	.....	
Separators, rear blocks.....	do.....	do.....	4	.....	.....	.....	
Shot tongs.....	With carriage.....	Forged steel.....	7 prs.	.....	.....	.....	Right and left.
Shot tray.....	do.....	Steel plate.....	1	.....	.....	.....	
Shot tray braces.....	do.....	Steel.....	2	.....	.....	.....	
Shot tray frame tie.....	do.....	Brass.....	1	.....	.....	.....	
Shot tray liners.....	do.....	do.....	2	.....	.....	.....	
Shot tray ring.....	do.....	Steel.....	1	.....	.....	.....	
Shot tray ring top support.....	do.....	Brass.....	1	.....	.....	.....	
Sight standard.....	Chassis, right side.....	Bronze.....	1	.....	.....	.....	
Sighting handle.....	Top carriage.....	Wrought iron.....	1	.....	.....	.....	
Sliding plate.....	In guides.....	Steel.....	1	.....	.....	.....	
Sliding plate bracket.....	On sliding platform.....	Wrought iron.....	2	.....	.....	.....	
Sliding plate connecting rods.....	Between sliding plate and top carriage.....	do.....	2	.....	.....	.....	Wrought-iron pipe.
Sliding plate connection to top carriage.....	Top carriage.....	do.....	2	.....	.....	2	1.75-inch nuts, standard.
Sliding plate guide.....	do.....	do.....	2	.....	.....	.....	
Sliding plate guard.....	Loading platform.....	Bronze.....	1	.....	.....	.....	
Spring, spiral.....	On elevation disk hub, and fastened to elevation disk case by spring stud.....	Forged steel.....	1	.75 wide	165	.....	.078( $\frac{1}{16}$ ) thick.
Spring stud.....	On elevation disk case, holding spiral spring.....	Forged steel.....	1	.....	2.625	.....	
Steps.....	On step hangers.....	do.....	4	.....	.....	.....	
Step hangers.....	On racer.....	do.....	2	.....	.....	.....	
Stops, counter recoil.....	On chassis.....	Steel.....	2	.5 pipe plug.	.....	.....	
Stop pins.....	Retraction blocks.....	do.....	12	.....	.....	.....	0.19 inch diameter by 0.5 inch.
Stuffing box bushing.....	In recoil cylinders.....	Bronze, No. 1.....	2	.....	.....	.....	
Stuffing box followers.....	In stuffing box.....	do.....	2	.....	.....	.....	
Stuffing box gland.....	do.....	do.....	2	.....	.....	.....	
Throttling bars.....	Recoil cylinder.....	Forged steel.....	4	.....	.....	.....	
Throttling bar bolts.....	In throttling bars.....	Steel.....	36	.75	2.45	.....	Washer head; 36 0.05-inch lead washers.



Throttling bar bolt washers.....	On throttling bar bolts.....	Copper.....	36	.....	.....	.....
Top carriage.....	On chassis.....	Cast steel, No. 2.....	1	.....	.....	.....
Transom.....	Front of chassis.....	Steel, No. 1.....	1	.....	.....	.....
Traversing bevel gears.....	On shaft for sprocket wheel.....	Bronze, No. 1.....	1	.....	.....	34 teeth, 1.5-inch pitch.
Traversing bevel pinion.....	On shaft for spur wheel.....	Forged steel, No. 2.....	1	.....	.....	17 teeth, 1.5-inch pitch.
Traversing chain.....	Around base ring.....	Wrought iron.....	1	.....	.....	Length over 320 inches, 0.625 inch diameter of wire.
Traversing chain adjusting bolt.....	In lugs on base ring.....	Forged steel.....	2	1.5	.....	Right-hand square threads, 4 per inch.
Traversing chain adjusting bolt nut.....	On adjusting bolt.....	do.....	2	1.5	.....	Do.
Traversing chain adjusting bolt pin.....	On adjusting bolt.....	Steel.....	2	.....	.....	20.1875-inch split pins.
Traversing chain adjusting bolt washer.....	On adjusting bolt.....	do.....	2	.....	.....	.....
Traversing chain guide wheel.....	On guide wheel studs.....	Wrought iron.....	2	1.75	.....	8 threads per inch; 20.5-inch counter-sunk screws.
Traversing chain guide wheel stud.....	Front guide hooks.....	Forged steel, No. 2.....	2	.....	.....	Standard.
Traversing chain guide wheel stud nut.....	Stud for guide wheel.....	Steel.....	2	1.5	.....	20.25-inch lock keys.
Traversing chain guide wheel stud washer.....	do.....	do.....	2	.....	.....	2 0.375 by 4.25 inch split pin, 2 brass sleeves.
Traversing cranks.....	On traversing crank shaft.....	Wrought iron.....	2	.....	.....	1.04375 by 0.625 by 5.5 inch key.
Traversing crank shaft.....	In bearing on chassis.....	Cold-rolled steel.....	1	.....	104	10.5-inch set screw.
Traversing crank shaft collar.....	On traversing crank shaft.....	Steel.....	1	.....	.....	.....
Traversing stop.....	Rear guide hook.....	do.....	1	.....	.....	.....
Traversing stop pins.....	Base ring.....	do.....	2	2	.....	.....
Traversing spur pinion.....	Traversing crank shaft.....	Steel, No. 2.....	1	.....	5.1	End threaded, head slotted.
Traversing spur pinion.....	Traversing spur wheel shaft.....	Bronze, No. 1.....	1	.....	.....	19 teeth, 1-inch pitch.
Traversing spur wheel.....	In bearings on chassis and front guide hook.....	Cold-rolled steel.....	1	.....	34	76 teeth, 1-inch pitch.
Traversing spur wheel shaft.....	On base ring.....	Forged steel, No. 3.....	1	.....	.....	2 0.45 by 0.65 inch keys.
Traversing rollers.....	Traversing sprocket wheel shaft.....	Cast iron.....	20	.....	.....	.....
Traversing sprocket wheel.....	Front guide hook.....	Cold-rolled steel.....	1	.....	30	2 0.5 by 0.7 inch keys; 20.75 by 1 inch headless screws.
Traversing sprocket wheel shaft.....	For piston rods.....	Steel.....	2	.....	.....	.....
Wrenches.....	For rear cylinder cover.....	Forged steel.....	1	.....	.....	.....
Wrench, bar.....	For guide hooks.....	Wrought iron.....	1	.....	.....	.....
Wrench, box.....	For elevating rack.....	do.....	1	.....	.....	.....
Do.....	For friction clamp nut.....	Forged steel.....	1	.....	.....	.....
Do.....	For 0.5 and 0.625 inch nuts.....	do.....	1	.....	.....	.....
Wrench, double.....	For 0.75 and 1.5 inch nuts, chain connection and throttling bars.....	do.....	1	.....	.....	.....
Do.....	For 0.875 and 1 inch nuts.....	do.....	1	.....	.....	.....
Do.....	For 1.125-inch nuts.....	do.....	1	.....	.....	.....
Wrench, single.....	For 1.25-inch nuts.....	do.....	1	.....	.....	.....
Do.....	For 1.625-inch nuts.....	do.....	1	.....	.....	.....
Do.....	For 1.75-inch nuts.....	do.....	1	.....	.....	.....
Do.....	For 2-inch nuts.....	do.....	1	.....	.....	.....
Do.....	For 2.5-inch nuts.....	do.....	1	.....	.....	.....
Wrench, spanner.....	For stuffing box gland.....	do.....	1	.....	.....	.....

*Names of the parts of the 10-inch barbette carriage, model of 1893, with their location and the material of which they are made—Continued.*

AMMUNITION TRUCKS, THREE TO A CARRIAGE.

Name of part.	Location.	Material.	Num- ber.	Diam- eter.	Length.	Nuts.	Remarks.
Axle.....	On framing collars.	Forged steel.	1	Inches.	Inches.		2 0.25-inch split pins.
Bracket.....	Riveted on framing.	Bronze.	1				Rubber tire.
Caster.....	On bracket.	Cast steel.	1				10.25-inch and 20.275-inch taper pins.
Cartridge pans.	On support.	Steel plate.	2				Right and left.
Caster pin.....	In caster.	Forged steel.	1				2 0.375-inch rivets.
Caster wheel.....	On caster pin.	Cast steel.	1				Rubber tires.
Collars.....	On caster and axle.	Cast steel.	3				
Framing collars.	Riveted to framing.	Forged steel.	2				
Handle.....	In upper frame.	do.	2				
Roller bushings.	In caster and truck wheels.	Ash.	3				
Truck wheels.	On axle.	Cast steel.	2				

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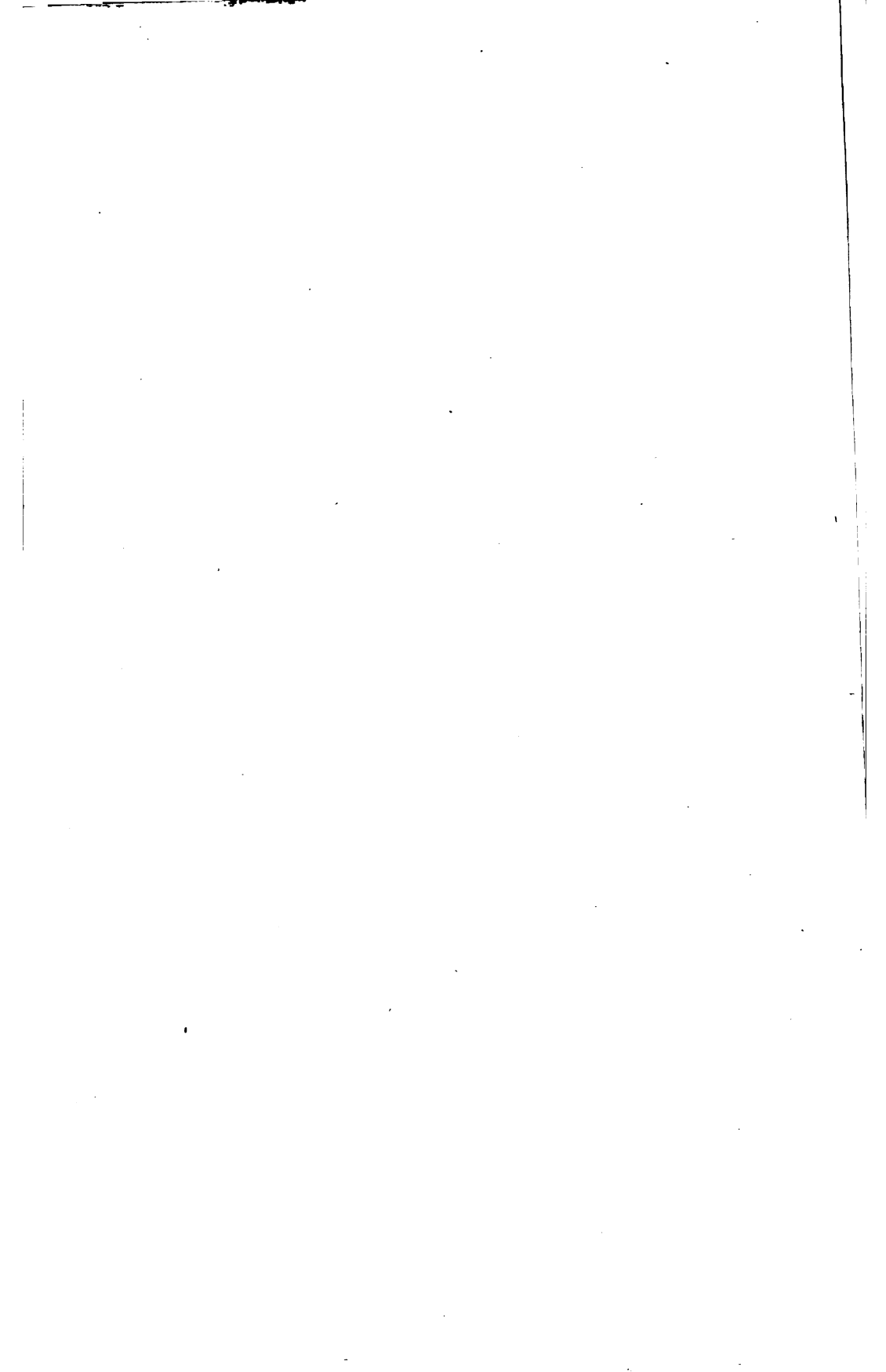
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